Ten New Records of Mosses from Doi Inthanon National Park in Thailand

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Abstract

Ten species of mosses collected from Doi Inthanon National Park are reported newly for the flora of Thailand. Of these, *Rhizomnium* and *Oligotrichum* are two new moss generic records for the country. The report includes notes on ecology, morphology, taxonomy, and distribution of the new species records.

Introduction

Thailand is located centrally in continental SE Asia. The country encompasses a total land area of 513,115 km^2. The elevation ranges from sea level to 2,565 m (Doi Inthanon). Because of its geographical position, the flora is rich in temperate Himalayan and Chinese elements in the north, and in tropical Malesian moss taxa to the south.

The moss flora of Thailand has been studied intermittently since the first westerner, J. Schmidt, collected moss specimens from Koh Chang in 1899 and 1900 (see Brotherus, 1901). Dixon (1932) published the first moss checklist for Thailand based on the large collections of A.F.G. Kerr. When Tixier (1971) published a summary of moss taxa for Thailand, the flora consisted of 500 species. In his paper, Tixier analyzed the floristic affinity of the moss flora of Thailand, which showed nearly an equal percentage of species sharing with the Indian subcontinent, Indochina and Malesia.

From 1950 on, bryological activities in Thailand have intensified with the participation and publication of bryologists from The Netherlands (see Touw, 1968), France (Tixier, 1971, 1972), Japan (Horikawa and Ando, 1964), Singapore (Tan and Iwatsuki, 1993; Tan and Tran Ninh, 1998; Tan *et al.*, 2006), USA (He, 1998), and Denmark (Larsen, 1979, 1992). A recent listing of the bryoflora prepared by Sornsamran and Thaithong (1995) reported 644 species of mosses based on publications from 1900-1979 (see Tan, 1998).

More recent researches on Thai mosses include a number of local workers, such as, Chantanaorrapint *et al.* (2004), Koronochalert (2006), Manachit (2006), and Wongkuna *et al.* (2009). Finally, an updated checklist of Thai mosses prepared electronically and housed at Missouri Botanical Garden (see http://www.mobot.org/MOBOT/moss/Thailand/welcome.shtml) listed 620 species and 31 subspecific taxa in 190 genera and 52 families.

In this paper, we report 10 new moss records for the Thai flora collected from Doi Inthanon National Park, Chiang Mai Province. All the new records are collected from montane evergreen forests at an elevation above 2000 m. Of these, *Rhizomnium* and *Oligotrichum* are two new generic records for the country's moss flora. The voucher specimens are deposited, as indicated separately under each species entry, at the Herbarium of Chualongkorn University (BCU) and the Herbarium at Singapore Botanic Gardens (SING).

New Records of Thai Moss Flora

Family Fissidentaceae

1. ***Fissidens obscurus*** Mitt. **Fig. 1.**

This is a medium sized plant that is dark green in color. It was collected on wet rock and sandy soil. *Fissidens obscurus* is similar to *Fissidens polypodioides* Hedw., but easily recognize by having abundant tomentose rhizoids on the underside of stems. The lack of hyaline nodule on the stem, the smooth leaf cells, the absence of leaf limbidium and the obtuse to obtusely acute leaf apex, in combination, identify this species.

Fissidens obscurus has a widely scattered distribution in China, Japan, Nepal, India, and now in northern Thailand.

Specimens studied: *Y. Nathi 914, 1015, 1024* (BCU).

Family Hypnaceae

2. ***Glossadelphus prostratus*** (Dozy & Molk.) M.Flesich.

Syn. *Taxiphyllum prostratum* (Dozy & Molk.) W.R.Buck

The plants were collected from Kew Mae Pan on Doi Inthanon, forming a mat of intertwined, fine and elongate branches. Leaves are small, about 0.25-0.4 mm long, varying from ovate with obtuse apex on branchlets and near the distal ends of branches, to ovate with short acuminate apex on primary and secondary branches. Leaf margins are serrate and the elongate laminal cells are often prorulose.

Glossadelphus prostratus is known already from China, Laos, Vietnam, Indonesia (Java, Lombok, Irian Jaya), Papua New Guinea and several Pacific Islands. It is not surprising to find it in Thailand.

Specimen studied: *Y. Nathi 945* (BCU, SING).

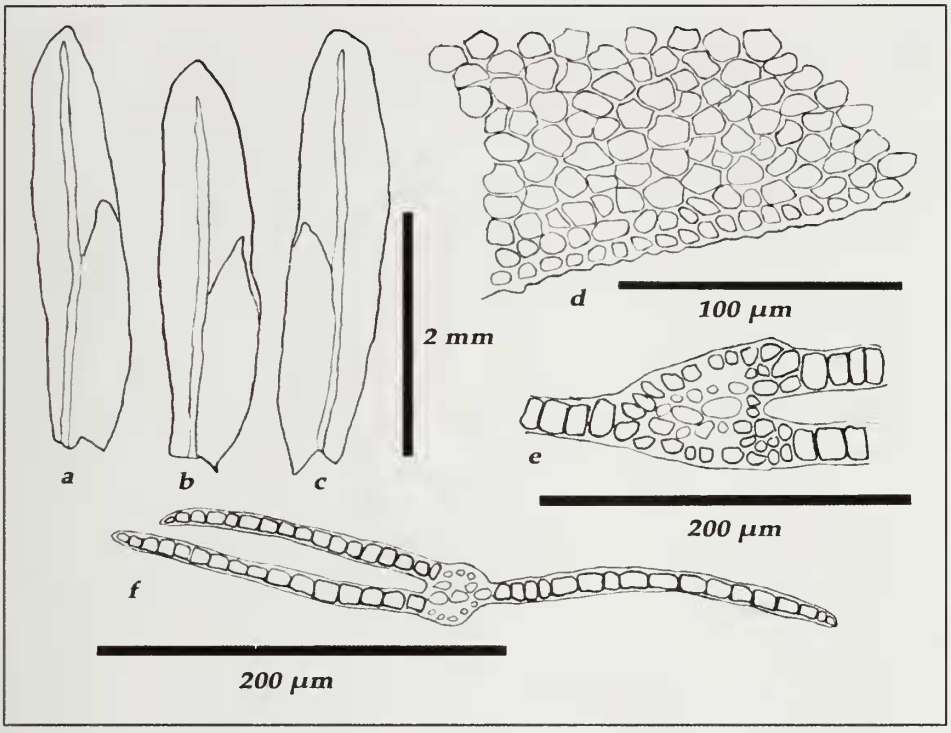

Figure 1. *Fissidens obscurus*. a-c. Leaves; d. Cells at leaf margin; e- f. Cross section of leaf.

Family Meteoriaceae

3. ***Meteorium subpolytrichum*** (Besch.) Broth.

This epiphytic moss species is large, dark-green and densely branched. Leaves are imbricate to appressed on branches, but the overall morphology of the branch foliation is not as strongly julaceous as in *Meteorium buchananii* (Brid.) Broth. The ovate-oblong to ligulate leaves have rounded to truncate apices, auriculate and undulate bases, and crenulate leaf margins; costae reach *ca* 2/3 of the leaf length.

Meteorium subpolytrichum is distributed in the Himalayas, China, Japan, the Philippines and is here reported from northern Thailand.

Specimens studied: *Y. Nathi 137, 262* (BCU).

Family Mniaceae

4. ***Rhizomnium striatulum*** (Mitt.) T.J.Kop. **Fig. 2.**

The two specimens of *Rhizomnium striatulum* were found along a shaded stream, growing on rocks on Doi Inthanon. The plants are small and their stems are dark to reddish, 0.8-1.0 cm long. Leaves are elliptic to obovate in outline, slightly contorted when dry and widely spreading when moist. Leaf borders are entire, strong and dark brown in color, comprising

of 2-3 rows of linear and elongate-rectangular cells. The leaf tip ends in an apiculus and the costa ends near the leaf apex.

Rhizomnium striatulum is a new species record and also a new generic record for the flora of Thailand. Distribution of this species is from Eastern Russia, Korea, Japan, China, Taiwan, Himalayas to northern Thailand.

Specimens studied: *Y. Nathi 1016, 1051* (BCU).

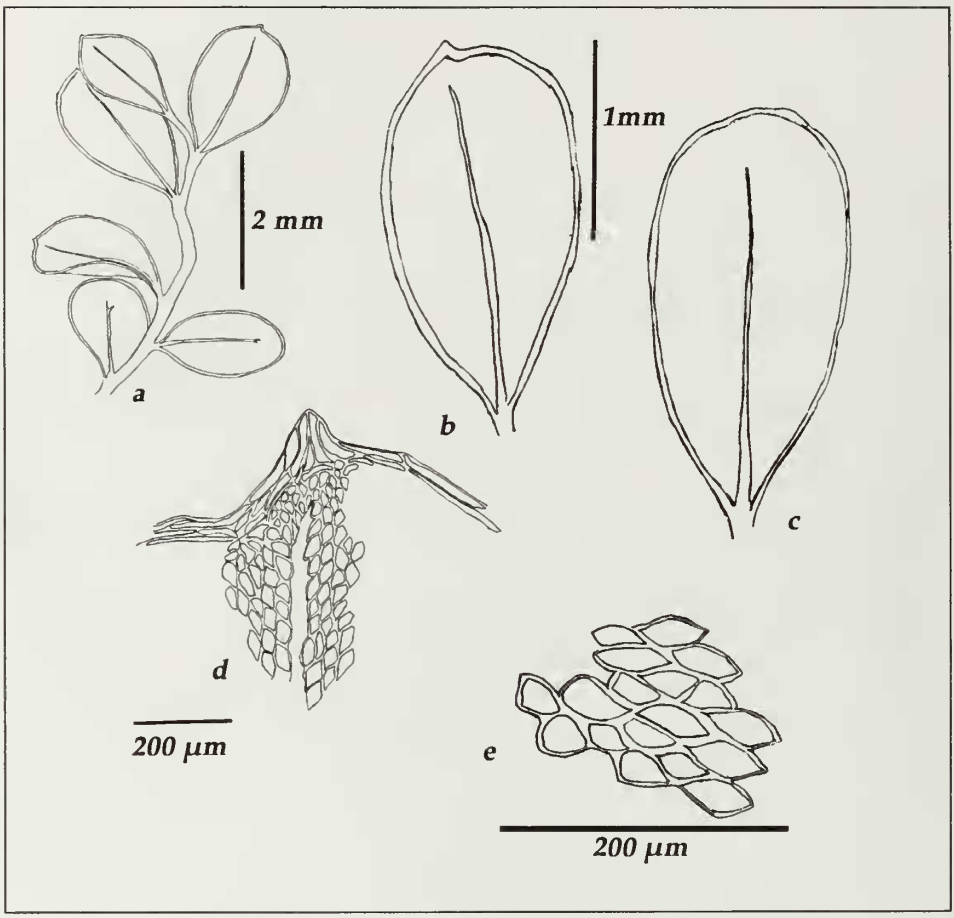

Figure 2. *Rhizomnium striatulum*. a. Plant habit; b -c. Leaves; d. Leaf tip; e. Leaf cells.

Family Polytrichaceae

5. ***Oligotrichum aligerum*** Mitt. **Fig. 3.**

This is a moss collected from the roadside on way to the summit of Doi Inthanon. The specimens were found growing mixed with species of *Pogonatum*. The plants are small and the stems are rigid and short, about 0.5-0.8 cm high. The leaves are oblong to oval in shape, covered with slightly wavy rows of ventral and dorsal lamellae, each lamella is 4-8 cells high. The

broadly acute to acute leaf apices and the presence of several low dorsal lamellae identify this species from the other members of the genus in continental SE Asia. *Oligotrichum aligerum* is a new generic and species record for Thailand.

Distribution of *Oligotrichum aligerum* ranges from North and Central Americas, Russian Siberia, Japan, Korea, China, Taiwan, northern Philippines, Nepal, India to northern Thailand.

Specimens studied: *Y. Nathi 29, 196, 955* (BCU).

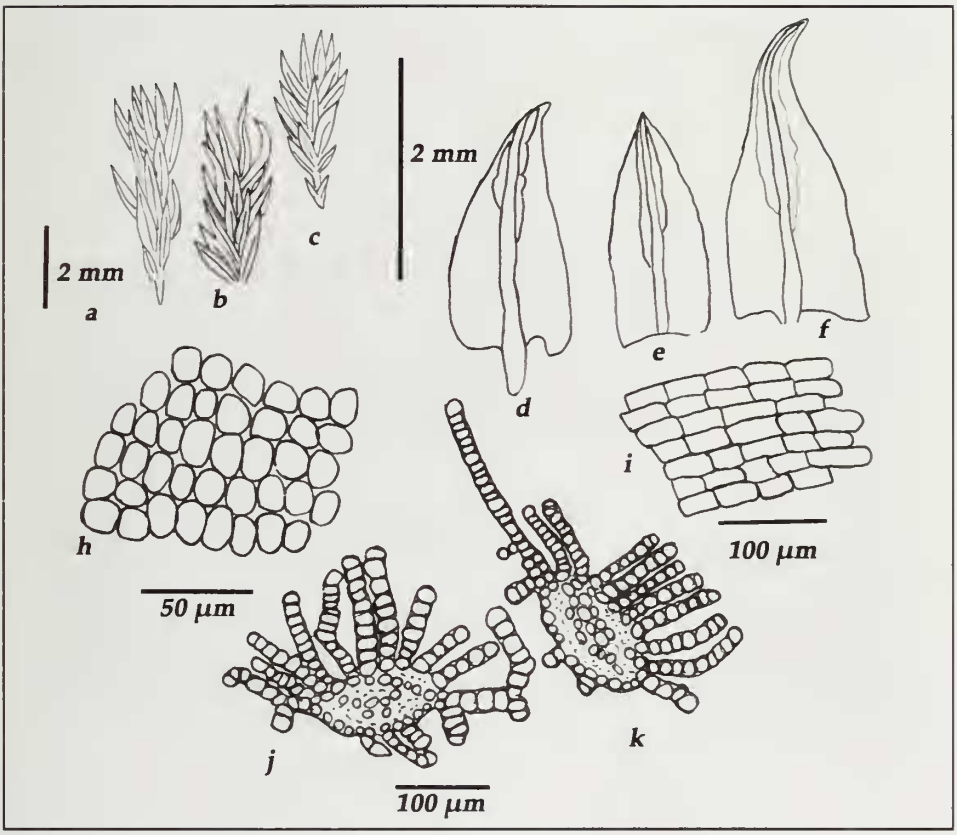

Figure 3. *Oligotrichum aligerum*. a-c. Plant habits; d-f. Leaves; h. Leaf cells; i. Leaf cell at base; j-k. Cross section of leaves.

Family Pottiaceae

6. ***Didymodon maschalogena*** (Renauld & Cardot) Broth. **Fig. 4.**

Syn. *Didymodon michiganensis* (Steere) K.Saito

Didymodon maschalogena grows along the roadside on Doi Inthanon and is easy to recognize because of the presence of abundant, uniquely dark and round gemmae in leaf axils. The plants are small, about 1-1.5 cm high.

Leaves are dense and close to stem when dry, but spread out when wet. Leaf shape is characteristically ovate and abruptly acuminate at apex. Its leaf margins are narrowly recurved in the lower part. Laminal cells are mostly round to hexagonal, slightly bulging and smooth, and arranged in observable longitudinal rows.

Didymodon maschalogena is known in North America as *D. michiganensis*. (Frahm *et al.*, 1996; Jiménez *et al.*, 2004). It is also known from Africa, Mexico, Japan, India, Sri Lanka, Himalayas, China and the Philippines. Its presence in Thailand represents a local range extension. A worldwide distribution map of this species was presented by Jiménez *et al.* (2004).

Specimens studied: *Y. Nathi 49, 411, 577, 986* (BCU).

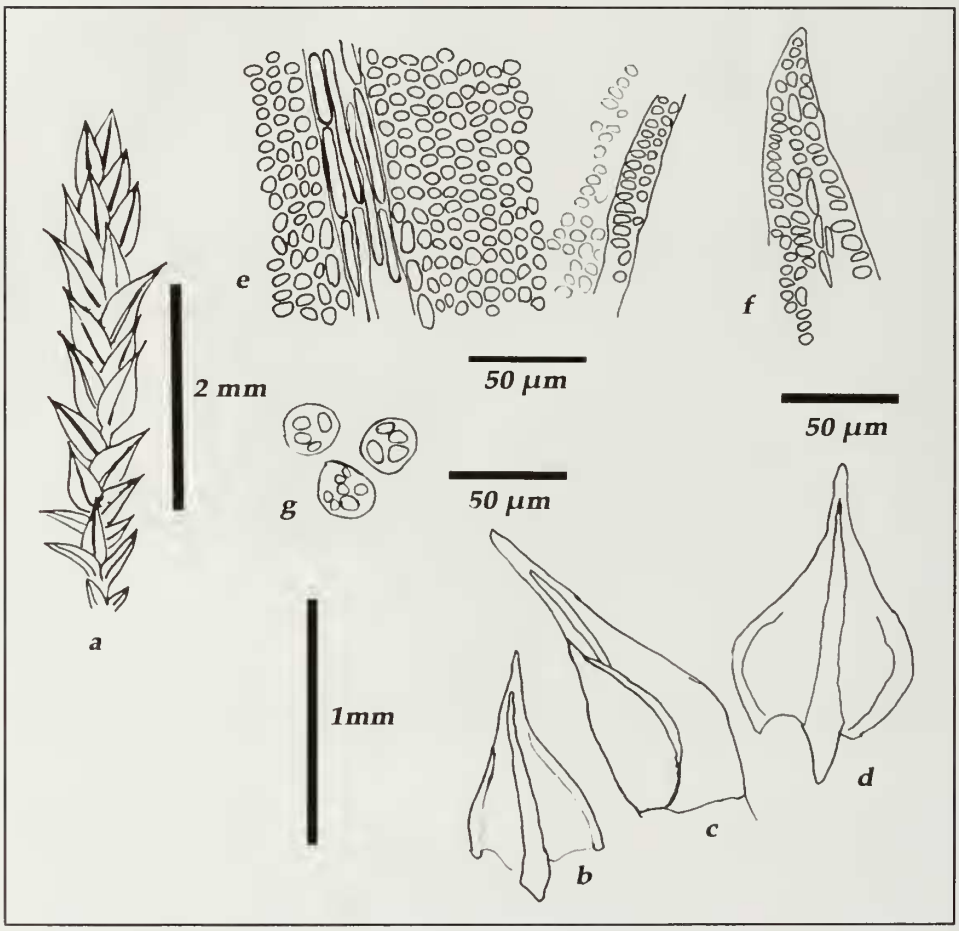

Figure 4. *Didymodon maschalogena*. a. Plant habit; b-d. Leaves; e. Leaf cells; f. Leaf tip; g. Gemmae

Family Sematophyllaceae

7. ***Clastobryopsis brevinervis*** M.Fleisch.

This is an epiphyte on branches in montane mossy forest near summit of Doi Inthanon. The plant is small, about 1 cm long. It is recognized by its single costa-like leaf appearance. Actually one of the two costae is short. As a typical member of the genus, the leaf base is decurrent and the alar cells are made up of a mixture of quadrate and rectangular, more or less thick-walled cells. Leaves of this species are lanceolate, acuminate, plicate, and the leaf margins are somewhat revolute.

Clastobryopsis brevinervis is distributed in China, Japan, Indonesia (Java, lesser Sunda), Malaysia (Sabah), the Philippines and Papua New Guinea. It is new to Thailand.

Specimens studied: *Y. Nathi 150, 627, 1071* (BCU).

8a. ***Clastobryopsis planula*** (Mitt.) M.Fleisch. var. ***planula*** **Fig. 5.**

This mat-forming species is commonly found in open sites of forest near the summit of Doi Inthanon. It grows on trunk and branches of trees. Stems are densely branched and produce an enlarged and complanate terminal with many propaguliferous gemmae found inside the leaf axil. Leaves are broadly ovate and ovate-lanceolate, double-costate, with acuminate tip, and the leaf margins are slightly reflexed. Leaf bases are decurrent and the alar cells are quadrate to rectangular in shape, often colored.

Clastobryopsis planula is known from China, Japan, India (Sikkim), Nepal, Indonesia, the Philippines, and is new to Thailand.

Specimens studied: *Y. Nathi 258, 328, 486, 838, 924, 959* (BCU).

8b. ***Clastobryopsis planula*** var. ***delicata*** (M.Fleisch.) B.C.Tan & Y.Jia

Although treated as a synonym of *Clastobryopsis planula* by many workers (cf. Tan and Jia, 1999), in Doi Inthanon National Park, this variety is distinctly small and more delicate in appearance. Its leaf outline is also narrower than the typical variety. It is also an epiphyte found on branches in upper montane forest.

Specimens studied: *Y. Nathi 55, 349, 525, 653, 664* (BCU).

9. ***Clastobryopsis robusta*** (Broth.) M.Fleisch.

This rather widespread tropical Malesian species grown on branches of a tree at Doi Inthanon and appears to be rare in occurrence locally. The two specimens represent undoubtedly juvenile plants. Stems are creeping and irregularly branched. Stem leaves are ovate-lanceolate to oblong-lanceolate in shape. The broadly ovate and somewhat plicate branch leaves, coupled with acuminate apex, broadly decurrent leaf bases, and narrowly recurved margins with teeth above, identify this species from its congeners.

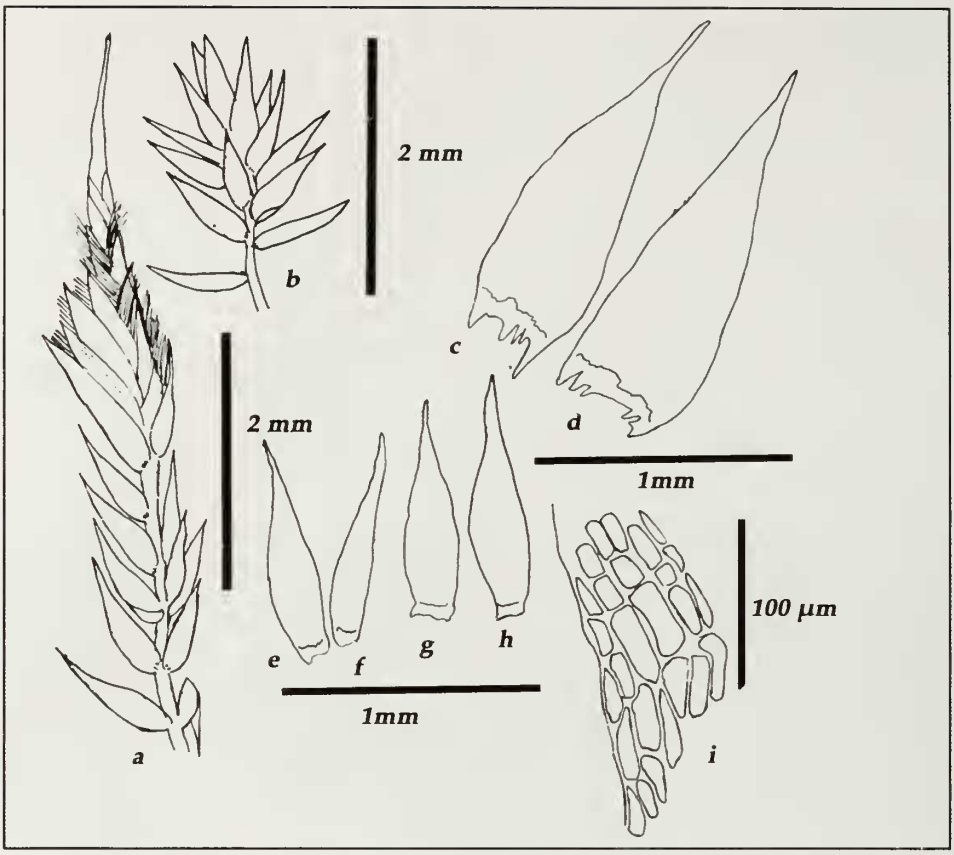

Figure 5. *Clastobryopsis planula.* a. Propaguliferus branch; b. Branch; c-d. Propaguliferus leaves; e-h. Branch leaves; i. Alar cells.

The leaf alar cells, like all members of the genus, are typically numerous, brownish, rectangular to quadrate in shape, and not inflated.

Clastobryopsis robusta is distributed in Japan, China (Taiwan), Philippines, Borneo, Java and Papua New Guinea. It is newly found in Thailand.

Specimens studied: *Y. Nathi 627, 1072* (BCU).

10. ***Warburgiella bistrumosa*** (Müll.Hal.) M.Fleisch. **Fig. 6.**

The specimens were collect from Kew Mae Pan Nature Trail at Doi Inthanon National Park. The small and slender plants are about 0.5 cm long, and irregularly branched. Leaves are narrowly lanceolate, gradually long acuminate, concave and mostly falcate. Leaf cells are smooth at base and develop a papilla on lumen of many cells in upper half of the leaf. Occasionally one or two leaf cells can be observed to have two papillae. Alar cells are big, thin-walled and inflated.

This species was treated as *Trichosteleum bistrumosum* (Müll. Hal.) A.Jaeger (see Bartram, 1939) because of its unipapillose leaf cell character. Since no species of *Trichostelum* in the region have such strongly falcate leaves, we preferred to follow Fleischer (1904-1923) in placing it in *Warburgiella*. We also think that the leaf morphology of the species indicates a possible link to *Radulina*.

Warburgiella bistrumosa, an endemic species in the Philippine, is now found in Thailand.

Specimens studied: *Y. Nathi 109, 207, 683, 1037* (BCU).

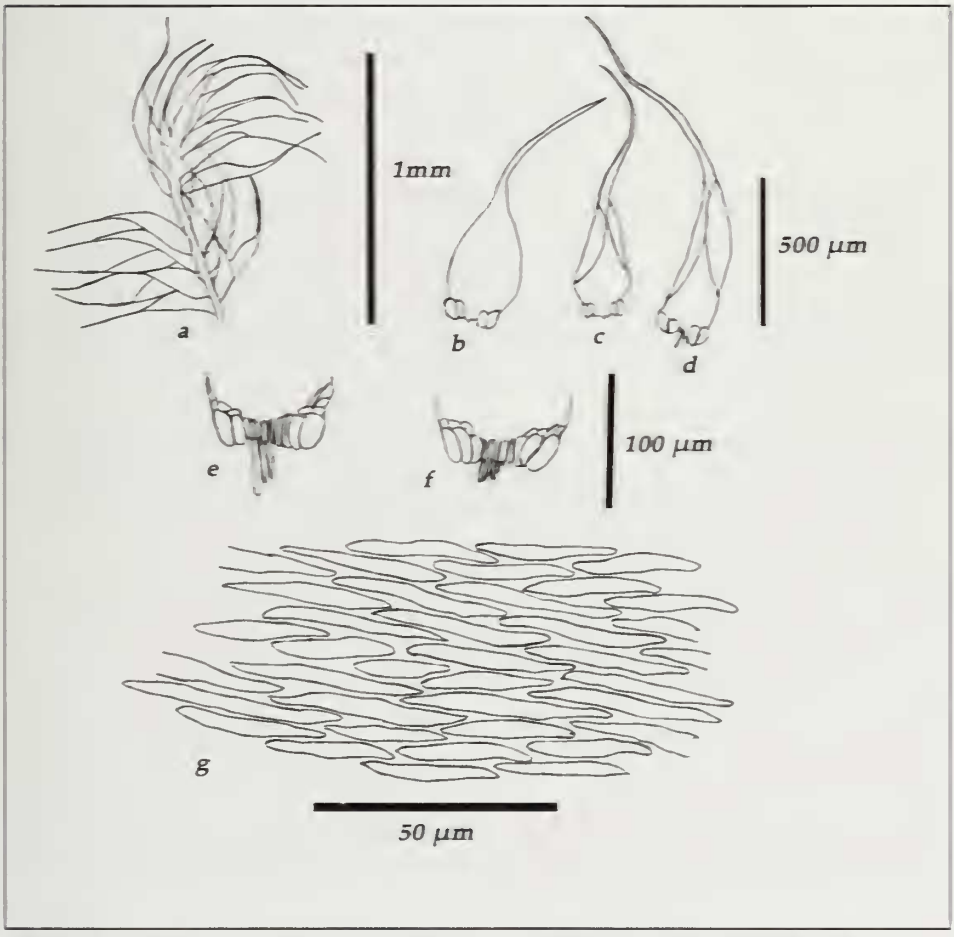

Figure 6. *Warburgiella bistrumosa*. a. Branch; b.-d. Leaves. e-f. Alar cells; g Leaf cells.

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